A. J. S. S.

BULLETIN
of the
AMERICAN ASSOCIATION OF JESUIT SCIENTISTS

(Eastern Section)

(For private circulation)

Vol. I. November - December, 1923. No. II.

SUMMER SCIENCE SCHOOL

Fordham University was the last scene of the Science Summer School for the Scholastics of the Maryland-New York Province. While the large Summer School for the Clerics' Juvenists has always had its session at Keyser Island the Science Summer School, since its inception in 1907 has carried on its work during different summers at Boston College, Holy Cross, Georgetown and Canisius. Fordham was selected this year by Rev. Fr. Provincial and the choice proved a wise one. Work began on July 17th and there were lectures and laboratory every morning except Sundays and the feast of St. Ignatius. Fr. T. M. Brock of Woodstock was in charge and besides the scholastics teaching in our provinces, there were also in attendance several from the Canadian and the New Orleans provinces. The course in Biology was in charge of Father H. C. Avery. Fr. G.L. Coyle of Holy Cross and Fr. G. F. Sandmeyer from Woodstock directed the work in General Chemistry and Quantitative Analysis. Fr. Brock lectured on Theoretical Electricity with special reference to alternating currents. Fr. W. J. Ahern, after running over the rains of gotorment at Canisius to his successor Fr. F. P. Cusick, joined the staff and lectured on Geology and Astronomy. Fr. T. E. Dapperman of Johns Hopkins gave two interesting lectures, - one on his work during the past year at the University and one on the most discussed Quantum Theory. It happened this year that there were a few general scientific excursions. The most interesting was a tour inspection of the Hell Gate Station of the United Electric Light and Power Co. This visit was arranged through the good offices of Mr. Walter C. Keenan, brother of Fr. F. P. Keenan of Woodstock, who was one of the chief Engineers who designed the Steam Mechanical part of the plant. Mr. Keenan accompanied the party. The hospitality of the Dean and of the Superiors and the excellent equipment of the laboratories was much appreciated by all. The university Summer School in session at the same time with the large attendance of various students added to the academic atmosphere.

THE SCIENCE CONVENTION

The second meeting of the Association of Science and Mathematics Teachers of the Province, held at Fordham University, on August 10th and 11th, formed a fitting close to the Summer School. The Association owes its existence to the zeal and enthusiasm of Fr. Ahern; for it was under his inspiration that it was organized in 1922 at Canisius College, Buffalo. He was also elected first president. He presided over the general sessions this Summer, at the first of which, Fr. D. K. Rankin, the director of the University Summer School made an address of welcome in the name of Rev. Fr. Rector who was absent on account of illness. Fr. Ahern's presidential address was on the length of geological time and the addresses of the vice presidents for the several sections were as follows: Biology, "Recent Discoveries of Pre-Historic Human Remains," by

Fr. Jos. S. Dinneen, Chemistry, Dyes and Dyeing, by Fr. G. L. Coyle; Physics, "Some Problems relating to Energy," by Henry M. Brock. A number of interesting papers were read and discussed. Abstracts of these will appear later. Through the good offices of Father Ahern and the kindness of Mr. E. M. Fadman (?), the Einstein Relativity Film was shown on Friday Evening, August the 10th. Fr. T. C. Phillips on this occasion gave a searching critique of the film and gave a lecture on "Some Astronomical and Other Tests of the Einstein Theory." During the business meeting, the constitution was adopted and the officers of the coming year were elected. The latter are as follows:

President.....Fr. M. J. Ahern
Secretary.....Fr. J. B. Kuenzen
Chairman Biology Section.....Fr. J. S. Dinneen
Chairman Chemistry Section.....Fr. G. L. Coyle
Chairman Physics Section.....Fr. H. M. Brock

THE BULLETIN

When the Association was organized it was decided to issue a Bulletin which might serve as a bond of union for the members and a sort of clearing house of information and data concerning our respective sciences, for the proposal and solution of difficulties met in the lecture and laboratory, for references to books new and old and to articles of interest in current scientific literature. The advantages of such a paper to develop a spirit of fraternal helpfulness are obvious. Our colleges and high schools are scattered throughout the northeastern section of the country. Professors are busy with their daily tasks and there is little or no opportunity to meet for the discussion of difficulties and to lies of common interest. The Bulletin can help to bring men together. By its means as was stated in the first number "each member may know what is being done in other parts of the province, suggest improvements in various lines, acquaint others with a particular instrument, experiment, book or discovery that may be just the thing the fellow teacher is seeking." It is clear however that a Bulletin cannot exist without contributions. Being the organ of the members of the Association, it must depend upon them for articles, notes, etc., and as our numbers are as yet comparatively small each member should consider himself an occasional contributor at least as well as a constant reader. Learned or highly original articles are not necessary. Anything of common interest will be welcome. If you come across some new book or some new article which is not likely to be seen by all, or learn of some new method or experiment, or if you have achieved some new triumph in Radio, or if you have found some new scheme to arouse the interest of your students or to make them work, do not hesitate to share your find with your fellow-teachers.

EINSTEIN'S THIRD PREDICTION

In connection with Fr. Phillips' masterly discussion of the observational proofs of Einstein's theory at Fordham, it is of interest to note that at the thirtieth meeting of the American Astronomical Society held at the Mt. Wilson Observatory in California last September, Dr. Charles E. St. John of the Observatory Staff announced that he had obtained evidence of the truth of the third prediction that Einstein had deduced from his general theory of Relativity. He found a change in the wave length of a number of lines of the solar spectrum with a corresponding displacement towards the red. That is, the absorption in the sun spectrum due to certain elements were not identical in position with the bright lins produced by the same elements here on earth. The displacement is quite distinct from that caused by the Doppler Effect and from conditions in the solar and terrestrial atmospheres. St. John calculates

that the Einstein effect amounts to 90% of the total displacement. This announcement seems to settle a question which has been in doubt for some four or five years. After Einstein had published his prediction, two observers at Bonn announced that they had discovered the displacement. St. John at about the same time sought for the effect with much more powerful instrumental equipment but obtained negative results. Evershed met with no great success. As a consequence, the scientific world did not feel itself justified in considering the third prediction verified. The displacement now seems to be established fact. (cf. Popular Astronomy, Nov. 1923; Science, Oct. 26, 1923.)

FATHER JOHN D. HEDRICK.

Members of the Association learn with sorrow the recent death of Fr. John D. Hedrick at St. Andrew-on-Hudson. He was an accomplished mathematician and astronomer and before entering the Society had the distinction of being one of the small band of pioneer American astronomers to engage in the mapping of the stars in the Southern Hemisphere. Dr. Benjamin A. Gould organized for the Argentine Republic a National Observatory at Cordoba, and began observations in 1870. Fr. Hedrick became one of his associates in the late '70s. He probably worked on the great zone-catalogue of 73, 160 stars published in 1884. He was for many years professor of Mathematics, Astronomy, and Geology at Woodstock and was one of the founders of the Observatory. So it was he added the transit room to the original equatorial room. It was believed by many generations of Woodstockians that he initiated to the mysteries of the stars for his religious spirit, his zeal and enthusiasm, and his kindly sense of humor. He was frequently minister of St. Ignatius and for some thirty years was editor of the Odds published at Woodstock.

W. I. P.

SOME INTERESTING TIDE FORMULAE.

We are all familiar with the fact that there is a constant ebb and flow of the ocean waters giving us the tides twice a day. These tides are due to the variation in the force of attraction of the moon and, to a lesser extent, of the sun on the various portions of the earth which are nearer the sun and the moon and less for those which are more remote. The same portions which raise the waters act in a similar way on the solid portions of the earth as well as on the liquid portion; and hence, unless the solid portion is perfectly rigid, there should be tides in the solid crust of the earth as well as in the liquid envelop. And in fact both theory and direct experience show that such tides exist and that, though the earth is as rigid as a sphere of steel, the differential attraction of the sun and the moon for its various parts produces a tidal rise and fall of the ground which is one half of the rise and fall produced by these same forces in the free expanse of the great oceans. Mr. Walter D. Lambert, mathematician of the U. S. Coast and Geodetic Survey has kindly furnished us with the formulae and necessary data for computing the tidal rise and fall of the ground at Woodstock or elsewhere. In this brief paper, we will give in a condensed form the principle formulae only, omitting those elements which have very little influence on the results. The mathematical theory can be found in extenso in Sir George H. Darwin's article "TIDE" in the Encyclopedia Americana.

The level of the ground above or below its mean position at any place and time is given by the following formulae:

H_m = 16.0 (sin 2 θ sin 2 d cos a + cos² θ cos² d cos 2a) centimeters.

H_s = 7.4 (sin 2 θ sin 2 d' cos a' + cos² θ cos²d' cos 2a') cm.

In these formulae:
H_m is the height of tide produced by moon
H_s is the height of tide produced by moon
θ is the latitude of the place (43°20' for Woodstock)
d is the declination of the sun
d' is the declination of the moon

These may be found at any given time from the American Ephemeris and Nautical Almanac or some similar almanac.

a is the hour angle of the moon, that is equal to 14.5° for every hour since the moon was on the meridian or due south.

a' is the hour angle of the sun, and is equal to 15° for every hour since the sun was on the meridian, i.e. since the sun was at apparent noon.

The total height or depth of the tide at any moment is the sum of the two quantities H_m and H_s calculated for the moment.

A simple application of the method for finding maxima and minima given in the ordinary course of Calculus shows that the maximum for the lunar tide is had when the moon is on the meridian and at the same time has a declination of near to 31° 47' as possible. (The greatest possible value of d is 28° 36'). The formula also shows that the maximum value varies with the latitude of the station and for the northern hemisphere is greatest in places in latitude 31° 47'.

Similarly, the maximum solar tide is had when a' is 0, i.e. when the sun is on the meridian or when it is apparent noon and d' has the greatest possible value of 23° 27'.

The method of finding maxima and minima also shows that a maximum value occurs about 7 hrs. before (or after) the maximum high tide; that is, of course, the preceding or following low tide. It is to be noted that the low tide is not as deep as the high tide is high.

The cases in which the maximum values for the sun and moon coincide occur at the new moon during the summer rostice in those years when the declination of the moon has its largest values. Hence we will get these simultaneous maximum values by putting

d = 28° 36'; d' = 23° 27'; a = a' = 0.

Substituting these values in the above formulæ and also putting θ = 30°20' we get the following maximum values of the two tides for Woodstock:

Maximum H_m 13.2 + 7.4 = 20.6 cm. or 8.1 in.
Maximum H_s 5.3 + 3.7 = 9.0 cm. or 3.6 in.

Hence under the conditions indicated above, i.e. when the two maxima coincide, the total tidal rise of the ground above its mean position will be the sum of the two values and

Maximum high tide at Woodstock = 29.6 cms. or 11.7 in.

The depression at the following low tide is found by putting 110° for the hour angle of the moon and 113.5° for that of the sun. This gives:

Maximum H_m = -5.7 - 10.1 = -15.8 cm. or -6.2 in.
Maximum H_s = -1.5 - 2.8 = -4.3 cms.or -1.7 in.

and the total depression at low tide is the sum of these two values or 7.9 in.

The range from high tide to low tide is therefore 48.7 cm. or 19.3 in. In other words, the ground at Woodstock rises and falls through a distance of over a foot and a half, being that much farther away from the centre of the earth at noon than at 5 o'clock in the morning and at 7 o'clock in the evening. The values just given are calculated for the sun and the moon at their mean distance from the earth; as the tide raising force varies inversely as the cube of the distance of the tide raising body, the values will be considerably increased when the sun and the moon are at their nearest positions to the earth; the increase of the lunar tides is 20% and for the solar tides it is 5%, so that the maximum range is increased to 23.5 inches or almost 2 ft.

Similar excursions from and towards the centre of the earth are made by the earth's crust at every place on its surface, though the range of motion varies, as was indicated above for different latitudes. The value of the tides at any given place may be found by substituting in the formulas we have used the proper values of latitudes and of other variables. Such a calculation makes an interesting problem in trigonometry and applied astronomy.

Fr. E. C. Phillips.

BIOLOGY

MARYLAND MUSHROOMS.

Mr. Busam and myself have been interested in the mushrooms around Woodstock. Over fifty specimens have been collected. All of these have been photographed by Fr. John Brosnan. While the work of identification is as yet incomplete owing to the lack of mycological books, still a number of specimens were known. We have representatives of gill, pore, tooth, coral and smooth surface types. Amanitas are by no means rare, nor are the boleti, cup fungi, tremellales, clavarioti and corals. One of the most interesting specimens found was the hedgehog mushroom. "Deer Steaks" and "oysters" in the collection make the list read like a menu. In fine, the number and variety are so plentiful in the early fall as to afford ample opportunity for profitable field work.

MENGE'S GENERAL BIOLOGY

It may be of interest to the biologists in the Province to know that Prof. Menge's (Marquette University, Milwaukee) "General Biology" has been adopted by Johns Hopkins for their Biology 2. Dr. Menge's assistant, Dr. John Giessen, M.A., has prepared a laboratory manual to accompany Dr. Menge's book. Though the manual is only in mimeograph form at present, it should be in print before the end of the year. It is well worth examining.

E. J. McWilliams.

CHEMISTRY

Laboratory suggestions: Cleaning Bunsen Burners:

Under laboratory usage bunsen burners readily become clogged. To clean them it is frequently necessary to unscrew the upright burner tube from the base in order to get at the small orifice through which the gas is delivered. This is apt to be a difficult problem especially if the burner is much corroded. In cleaning many burners, it was found that the top unscrews very easily if the following method is employed. Heat a Bunsen flame heat the burner in question at the CONNECTION OF THE TOP AND THE BASE. While still fairly warm, chill with cold water. Then unscrew the top, using if necessary, pliers, the jaws of which have been covered with sleeves of rubber tubing (or rubber tape.)

(Reprint)

In cleaning some burners which were in bad condition, it was found that they had to be heated for quite a while. But we never found a top which would not respond to this treatment.

QUERY:

Newell,(Laboratory Manual, p. 180, #243 b) gives the following test for sodium. The reagent used is Tartar Emetic solution in a slightly alkaline medium. The precipitate is said to be acid sodium pyroantimonate ($Na_2H_2Sb_2O_7$). So far I have not been able to find the data or the equation for this reaction, and a letter to Professor Newell brought no information. I would be thankful for any suggestions.

J. J. Sullivan, S. J.

CHEMICAL NOTES AND REFERENCES.

In the Journal of Biological Chemistry, 1923, lv, 349, there is outlined a method for making a standard acid solution. Though I have not tried it myself, still I think that the suggestion is very simple, practical and accurate. The standardizing agent is magnesium ammonium phosphate ($MgNH_4PO_4 \cdot 6\ H_2O$). This material can be obtained in an exceptionally high grade of purity. In fact it is quite easily made, if one has the time. Moreover it can be preserved unaltered for any length of time even exposed to the air. It loses 6 H_2O readily at 105°C, but the sixth molecule of water remains at 130°. To standardize an acid, merely distill the ammonia formed from a weighed amount of the phosphate into a known volume of the acid. This could probably be done best by putting a weighed sample of the phosphate into a Kjeldahl flask, 800 cc. capacity, adding 150 cc. H_2O then adding about 25cc. of concentrated alkali and distilling. The alkali can be added very safely and easily by pouring it through a bulb tube so that it will form a separate layer below the original solution. Then when the flask has been put in place on the distilling apparatus, merely give it a shake and the two layers will mix at once.

In the Journal of the American Chemical Society 1923, xlv, 1345, there appeared an article on the ionization of alcohols. It was shown that alcohols have weakly acidic but no basic properties. This will doubtless be of interest to organic teachers in that the statement is often made that alcohols are organic bases. The statement is of course not true and in addition is very misleading to students.

There appeared recently an article in an Italian publication on "THE [illegible] OF OXYGEN IN [illegible] TO [illegible]." The abstract of the article will be found in Chem. Abstracts, 1923, xvii, 1934.

T. A. Ripley, S. J.

(Reprint)